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INAUGURAL DISSERTATION,

BEING

AN ATTEMPT TO PROVE

THAT

CERTAIN SUBSTANCES

ARE CONVEYED,

UNCHANGED,

INTO THE

CIRCULATION;

OR,

IF CHANGED,

THAT THEY ARE

RECOMPOSED AND REGAIN

THEIR ACTIVE PROPERTIES.

By EDWARD DARRELL SMITH, A. M.
Of Charleston, South-Carolina,
MEMBER OF THE PHILADELPHIA MEDICAL SOCIETY.

PHILADELPHIA:
PRINTED BY WAY & GROFF,
No. 48, North Third-ſtreet.
1800.

AN

INAUGURAL DISSERTATION,

FOR THE DEGREE OF

DOCTOR OF MEDICINE:

SUBMITTED TO THE

EXAMINATION

OF THE

REV. JOHN EWING, S. T. P. PROVOST;

THE

TRUSTEES & MEDICAL FACULTY,

OF THE

UNIVERSITY OF PENNSYLVANIA,

On the thirty-first of May 1800.

TO

DOCTOR WILLIAM SMITH STEVENS.

TO the man of ſenſe the language of adulation is always diſguſting; but the grateful effuſions of an overflowing heart afford him real pleaſure. As the affectionate offering of ſuch a heart, receive the tribute now proffered by one, who ſtands in the double relationſhip of pupil and nephew.

EDWARD D. SMITH.

TO

DOCTOR WILLIAM SMITH STEVENS.

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TO

BENJAMIM SMITH BARTON, M. D.

PROFESSOR OF MATERIA MEDICA, BOTANY, AND

NATURAL HISTORY, &c.

THIS DISSERTATION

IS INSCRIBED

AS A MARK OF

RESPECT AND OF GRATITUDE,

FOR NUMEROUS FAVOURS

CONFERRED UPON HIS

OBLIGED FRIEND,

EDWARD D. SMITH.

INTRODUCTION

BENJAMIN SMITH BARTON, M. D.

DURING the reign of the Humoral Pathology, the opinion, that infectious were conveyed unchanged into the circulation, was necessarily adopted by the fupporters of that doctrine. It was fuppoſed that diſeaſe was ſeated in the fluids of the human body, and that medicines were valuable in proportion to their power of correcting or altering the vitiated fluids. Succeeding and more accurate obſervations having induced the belief that the doctrine of the Humoral Pathology was not founded upon ſufficient grounds, the opinion reſpecting the operation of medicines was likewiſe called in queſtion. From remarking that certain powerful ſubſtances excited their effects together, that it could not poſſibly be ſuppoſed they were carried into the circulation, many philoſophers were led to doubt in what other mode the various medicines operated. They founded their rejection of the old opinion principally upon two circumſtances, viz. that they were not able to diſcover, in any part of the courſe of the circulation, active ſubſtances which had been taken into the ſtomach; and that any fluid, even milk, which is the moſt aſſimilated to the blood, when injected into the veins of a living animal produced

INTRODUCTION.

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ſudden death. They aſſerted that the mutative power of the chylopoietic viſcera was ſuch, that every thing noxious was rejected, and only the nutritious parts of ſubſtances were permitted to paſs into the ſanguiferous ſyſtem. Finally, they referred all the phenomena, which were inexplicable to them, to a certain vague term called ſympathy; which, perhaps, involves as many or more difficulties than the former opinion. It is not pretended to be denied, that in the operation of certain medicines a ſympathy does appear to exiſt between certain parts of the body; but it alſo ſeems probable, that this ſympathy has had too great a latitude; and that certain circumſtances are referred to it, which are more eaſily explained on other principles. Many reſpectable inquirers continue to entertain the idea that ſome ſubſtances are found in their active ſtate after having entered into the circulation; and of conſequence that they muſt have paſſed unchanged, or if changed, have regained their original properties by ſome proceſs unknown to us. They grounded their opinion upon experiments and obſervations made with accuracy and fidelity: the accounts of theſe are to be found in various writings from ancient down to modern date: but, ſo far as is known to the author, there has been no compilation or collection of them into one maſs. As the only way to arrive at the knowledge of the truth is to poſſeſs a clear view of the evidence, and as this queſtion is deemed of ſome importance; it is contemplated in the following eſſay

to exhibit to the reader a brief ſketch of the arguments in favour of the opinion, that ſubſtances are found in their active ſtate after having entered the circulation.

The ſubject is divided into three ſections.

In the firſt I ſhall endeavour to ſhew that the queſtion is not a of trivial nature, or intereſting only as a matter of curioſity ; but that it is of much importance and practical utility. In the ſecond ſection will be given, in ſupport of the opinion adopted, the proofs as they appear in the fluid parts of the body. In the third, the proofs as they appear in the ſolid parts.

AN

INAUGURAL DISSERTATION, &c.

SECTION I.

Of the Importance of the Queſtion.

THE preſent queſtion is not merely of a ſpeculative nature, intereſting only to the curious obſerver, and not to the practical phyſician. It embraces a wider ſcope, and the determination of it will be of eſſential importance in many caſes that fall under our notice. A ſuperficial view of the ſubject may induce us to ſuppoſe, that it cannot be of any real utility; but by the reflecting enquirer, a different opinion will be formed. In endeavouring to inveſtigate a queſtion of this nature, we ought to diſcard the ingenious ſubtilties of metaphyſical reaſoning, which often confuſe, while they do not convict. Our data ſhould be facts well authenticated, from which we are to draw fair and juſt concluſions. Taking truth for our guide, and not ſuffering ourſelves to be warped by a prejudice for any particular opinion or theory, however plauſible, we ſhall moſt probably accompliſh the object of our purſuit. It is to be obſerved, that the ancients were ſtrongly impreſſed with the idea, that

certain ſubſtances were conveyed, with little or no change of their properties, into the circulation. Hence they preſcribed in certain diſeaſes, the milk of animals, which had fed upon peculiar vegetables proper for thoſe diſeaſes. We know that milk conſtitutes a conſiderable portion of the aliment of man, in almoſt every part of the globe. Some nations, as the Laplanders, have ſcarcely any other ſubſiſtence, during one ſeaſon of the year. If certain active ſubſtances are conveyed into it unchanged, it muſt ſurely be of importance to aſcertain theſe; as their introduction into the body, at ſome periods of life, and in certain ſtates of the ſyſtem, may be productive of pernicious conſequences. In like manner, much advantage may reſult, from introducing into the diſeaſed ſyſtem, in this way, medicines which could not be adminiſtered in any other. Subſequent facts will tend to prove, that very deſtructive habits may be thus acquired. An inattention to diet in a nurſe, is often the unſuſpected cauſe of diſtreſſing complaints in the ſucking child. Active medicines, taken into the circulating fluids of a nurſe, will affect the child in an alarming manner. Inſtances of this kind are not rare. If by the collection of facts on this ſubject, any hints may be given, which may lead to the diſcovery of a ſolvent of urinary or biliary calculi, it would be of eſſential ſervice to mankind. That this idea is not viſionary or impracticable, will be allowed by thoſe who have inveſtigated this ſubject

with attention. Although diſappointment may be frequently the reward of our exertions, yet by perſevering induſtry, we often accompliſh our undertakings.

It has generally been ſuppoſed, that the preparations of lead, externally applied, are innocent, and under ſome circumſtances ſalutary. But if caſes occur, in which it is abſorbed into the ſyſtem, producing miſchievous effects, it is ſurely of importance to keep theſe in view, in uſing lead. We may thus account for anomalous ſymptoms, which cannot be ſatisfactorily explained in any other manner. By knowing the cauſe of an evil, we may often remove the effect. On the contrary, the phyſician, who rejects entirely this opinion, will be perplexed about the ſituation of his patient; and by not removing the ſource, will aggravate the diſeaſe.

If it is diſcovered that certain medicines, by being externally applied, will be conveyed through the medium of the circulation, to different parts of the ſyſtem, and produce the ſame effects as when taken internally; will not this diſcovery be of conſiderable importance in peculiar habits, and in diſeaſes which will not admit of the internal uſe of medicines? Facts, to be related hereafter, will at leaſt render this ſuppoſition probable.

If it be aſcertained, that while moſt ſubſtances are animalized by the chyliform proceſs, and rendered ſubſervient to the nutrition of man, others are conveyed into the circulation unchanged; it is

ſurely of importance to inquire what are theſe ſubſtances, and in what circumſtances they are peculiarly injurious.

Theſe remarks, it is hoped, are ſufficient to excite the attention of the medical philoſopher, and to convince him, that the queſtion propoſed for conſideration, is not one of mere curioſity, but of real practical utility.

SECTION II.

Of the proofs, that ſubſtances are found in their active ſtate after having entered the circulation, as they appear in the fluids.

NOTWITHSTANDING what has been aſſerted reſpecting the wonderful mutative power of the chyliform proceſs, there are numerous inſtances of ſubſtances, after having entered the circulation through the lacteals, being found in their original ſtate in the different fluids of the body. We are likewiſe poſſeſſed of caſes where ſubſtances, conveyed by external abſorption through the lymphatics into the circulation, manifeſted their obvious properties: To place the facts in the cleareſt point of view, it is thought proper to arrange them as they reſpect

the chyle, blood, milk, ſaliva, urine, perſpiration, &c.

I. Chyle. The opinion, that ſubſtances ſuffered a change of their properties before they entered the lacteals, was principally founded upon the celebrated experiment of Dr. Wright. It was made with the view of aſcertaining whether chalybeates entered the blood. The experiment was this;—having kept a dog faſting ſixty-ſix hours, he forced him to ſwallow a quantity of bread and milk, with which a portion of ſulphate of iron was mixed: he opened him in an hour afterwards and collected ſome chyle from the thoracic duct, the colour of which was not changed by dropping the tincture of galls into it; although this tincture changed the colour to a deep purple when $\frac{1}{4}$ grain of ſulphate of iron was diſſolved in it.* From this the concluſion was drawn, that the lacteals had the power of rejecting chalybeates. On this experiment Dr. Percival obſerves "that it only evinces that the iron did not ſubſiſt in the chyle as a vitriol, qualified to ſtrike a black colour with galls; neither does the calx of iron, nor the glaſs of iron poſſeſs this power; yet, though changed, they are both capable of being reſtored to it: perhaps with equal reaſon it might be preſumed by one, ignorant of chemiſtry, that ſal-martis contains no iron, becauſe it is not acted upon by the load-ſtone." But there are experiments, which directly oppoſe

* Philoſophical Tranſactions, vol. 1, part 2, page 295.

that of Dr. Wright, and from which very different concluſions muſt be drawn. Dr. Muſgrave injected ſolutions of indigo and of ſtone-blue* into the ſmall inteſtines of dogs, which he had kept faſting for a conſiderable time. On opening the dogs ſome hours after, he diſcovered that the lacteals and alſo the thoracic duct were coloured with the injections.† "A great many ſubſtances may enter the lacteals along with the chyle, even ſolids reduced to fine powder. When indigo has been thrown into the inteſtines of a ſheep, I have ſeen the chyle rendered quite blue: now indigo is not ſoluble in water, but is a ſolid reduced into a very fine powder. So muſk gets into the chyle, giving it a ſtrong ſmell, and a great variety of other ſubſtances of various colours, various taſtes, and various ſmells, each of them giving colour, or taſte, or ſmell to the chyle."‡

II. Blood. It is aſſerted that foreign matters cannot be conveyed into the blood in their active ſtate, for that ſuch a mild fluid as milk, infuſed into it, produces death: granting for a moment that this is the fact, we may however obſerve that the caſe is different where ſubſtances are immediately introduced into

* "Stone-blue is a preparation of cobalt, pot-aſh, and white lead; which, being converted into glaſs, is ground into a fine powder."
PERCIVAL.

† Philoſophical Tranſactions abridged. Chap. 4. Part 2. p. 76.

‡ Fordyce on digeſtion.

the blood veſſels, and when they paſs through the common routine of the circulation: we may obſerve further, "that what paſſes by the lacteals or "lymphatics is carried into the thoracic duct, and "there mixed with a large portion of the chyle and "lymph, by which its acrimony is ſheathed and di-"luted, or its chemical properties changed before it "enters the maſs of blood."* We are informed of caſes, where foreign matters were actually ſeen floating in the blood. An inſtance is recorded of a milky diſcharge from the groin of a boy, which recurred ſeveral times and continued ſeveral days each time:* The chyle does not immediately become aſſimilated with the maſs of blood, but floats in it for ſome time in its original ſtate: The following inſtance is in point. "A maid, after eating a good "breakfaſt about ſeven in the morning, was let "blood about eleven the ſame day in her foot. "The firſt blood was received in a porrenger, and "within a little while it turned very white. The "laſt blood was received in a ſawcer, which turned "white immediately like the white of a cuſtard. "Within five or ſix hours after, I chanced to ſee "both; and that in the porrenger was half blood "and half chyle, ſwimming upon it like a ſerum as "white as milk; and that in the ſawcer all chyle, "without the leaſt appearance of a drop of blood. "And when we heated them diſtinctly over a gen-

* Percival. Eſſay on the operation of medicines.

† Edinburgh Medical Eſſays. Vol. 5.

" tle fire, they both hardened as the white of an " egg when it is heated, or juſt as the ſerum of the " blood doth with heating, but far more white. " This maid was then in good health, and only let " blood; becauſe ſhe never had her courſes, yet of " a very florid clear complexion."*

Experiments prove moreover, that the injection of medicines into the veins, is not neceſſarily fatal; but that adminiſtered in this way, they often produce their effects as certainly as when given in the ordinary manner. Thus we are informed by Haller,† that a poiſon or medicine injected into a vein, will produce certain determinate effects, as vomiting in the ſtomach, purging in the inteſtines, and drunkenneſs in the brain. Wahrendorf, in a village of Luſatia, injected wine into the veins of dogs, and remarked that it made them drunk. A ſolution of opium, injected into the veins, exerts its narcotic power even for two days. Vinous medicines, ſimilar to opium in their intoxicating power, produced ſimilar effects on living animals. Poiſons, infuſed into the veins, exert a ſpecific effect upon the different viſcera. Certain emetics, adminiſtered in this way, excite vomiting in the ſame manner as if taken by the mouth. Borrichius aſſerts, that the ſame doſe of medicine, which, taken by the mouth, purges, will produce a ſimilar effect if infuſed into the veins. Many others

* Lower. Tractatus de Corde, &c. † Elem. Phyſiolog. vol. I.

relate ſimilar caſes. Diuretic medicines, infuſed into the veins, are carried to the urinary organs, and produce the ſame effects as when ſwallowed. Two drams of the tincture of cantharides, injected into the veins of a dog, excited a moſt copious flow of urine, eroded his bladder and deſtroyed him in the ſecond experiment. Nitre, introduced in this manner, excited a copious flow of urine, without any ill conſequences. Eight or nine drops of ſpirit of tobacco, injected into a vein, produced vomiting and great diſtreſs. There are inſtances of the ſalutary effects of medicines, exhibited in this manner, in diſeaſes affecting the conſtitution. Purmann, a celebrated ſurgeon, cured himſelf of a cutaneous eruption, by injecting into his veins an infuſion of cochlearia with ſpirits of theriacalis. We have inſtances related of ſyphilis, cured by medicines introduced into the veins. And we read of a man, labouring under the moſt dangerous ſymptoms from the bite of a viper, being cured by ſpirits of hartshorn injected into his veins.

" We have injected by a ſyphon about two drams " of a laxative medicine into the median vein of " the right arm of three patients in the Hoſpital at " Dantzick. One of the patients was a luſty, ro- " buſt ſoldier. He, when the purgative liquor was " infuſed into him, complained of great pains in " his elbow; and the little valves of his arm did " ſwell ſo viſibly, that it was neceſſary by a gentle " compreſſion of one's finger to ſtroak up that

" ſwelling towards the patient's ſhoulder. Some
" four hours after it began to work, not very trou-
" bleſome, and ſo it did the next day inſomuch
" that the man had five good ſtools after it.

" The two other trials were made upon the other
" ſex. A married woman of 35 and a ſerving
" maid of 20 years of age, had been both of them
" from their birth very grievouſly afflicted with epi-
" leptic fits, ſo that there were little hopes left to
" cure them. They both underwent this operation,
" and there was injected into their veins a laxative
" roſin diſſolved in anti-epileptical ſpirit. The firſt
" of theſe had gentle ſtools ſome hours after the
" injection and the next day; the fits, recurring
" now and then, but much milder, are ſince al-
" together vaniſhed. As for the other, viz. the
" maid, ſhe went the ſame day to ſtool four times
" and ſeveral times the next; but by going into
" the air and taking cold and not obſerving any
" diet, ſhe caſt herſelf away.

" Mr. Smith hath adventured to open a vein and
" infuſe ſome medicines into the blood of two per-
" ſons, in the hoſpital of Dantzick, deſperately in-
" fected with the pox, whereof the one recovered
" and the other died."*

If credit be due to theſe facts, we cannot heſi-
tate in believing that active ſubſtances may mix with
the blood in their original ſtate. We muſt alſo
grant, that ſo far from being productive of any ill

* Philoſophical Tranſactions abridged. Vol. III. p. 234.

conſequences, they may be ſubſervient to beneficial views. It is not probable however that this mode of exhibiting medicines will ever be brought into general practice, as there is ſome inconvenience attending it, and as it is ſeldom or ever neceſſary. The examples are cited only to confirm the juſtneſs of the general principle, that active ſubſtances may enter the circulation with impunity.

Several additional arguments may be adduced in ſupport of what has been already advanced. Thus, it is aſſerted by Mr. Bell and others, that mercury cures lues venerea by mixing with, in the blood and neutralizing it. "Mercury will paſs into "the ſyſtem in various forms from the ſurface of "the body. Lues venerea has been cured by frequent "immerſions of the feet and legs in a ſolution of "corroſive ſublimate. The application of a mer-"curial plaiſter to the ſurface of the body, if of any "conſiderable extent, will alſo cure the diſeaſe."†

If the poiſon of contagious diſeaſes can circulate in the ſanguiferous ſyſtem without injury, why may not medicines, which are not more active, alſo paſs into the ſyſtem with impunity? It is well known that the lues venerea is communicated from the mother to the fœtus in utero. Some caſes of the ſmall-pox being communicated in like manner have occurred. Mr. Turnbull relates the caſe of a lady, who was inoculated in the ſeventh month of her pregnancy. Nine days after the eruption ſhe

† Bell on lues venerea. Chap. 4. Sect. 4.

received a fall, and in a few days after that was delivered of a dead child, which was covered with variolous puſtules in a ſtate of ſuppuration. The matter was proved to be variolous from its communicating the diſeaſe to ſeveral perſons who were inoculated with it.†

It has been denied by ſome that variolous matter could enter the blood in its active ſtate; but this and other inſtances convince us that it can. We ſhould therefore be cautious in inoculating pregnant women, as we may ſometimes unintentionally deſtroy their embryo offspring.

Some caſes are mentioned where the ſmall-pox was communicated by variolous matter introduced into the ſtomach.‡ In theſe there can be no doubt that the matter was taken into the circulation in its active ſtate in order to produce the eruption.

In a pregnant woman, who had uſed a conſiderable quantity of ſaffron, the liquor amnii is ſaid to have been tinged of a ſaffron colour.§

The fact being aſcertained, that active ſubſtances can enter the circulation and produce their ſpecific operation on different parts of the body, according to the different qualities which they poſſeſs; we have a clue afforded to extricate us from the labyrinth, in which we have been wandering. Certain pheno-

† Memoirs of London Med. Soc. Vol. IV. p. 364.

‡ Medical Repoſitory. Vol. I. p. 258.

§ Haller. Elements of Phyſiology. Vol VIII. de Fetu.

mena, which have been hitherto ſhrouded under the dark veil of ſympathy, are more eaſily explicable, it is conceived, by the opinion we advocate.

Tobacco beaten up into a poultice with vinegar or brandy and applied to the ſtomach, produces violent vomiting, and is very effectual in removing hard tumours of the hypochondria. Groundſel beaten down to a pulp and applied to the ſtomach, produces vomiting and cures agues.†

Oil of tobacco, dropped upon the tongue of a cat, impregnated the whole of the animal with its odour. The decoction of this plant, when the head was waſhed with it, cauſed vomiting, fainting, and convulſions—applied to the belly, it produced vomiting and intoxication—the oil in the form of ointment produced purging—the roots of white hellebore applied to the ſtomach, occaſion vomiting. Bitter medicines applied externally to the abdomen, deſtroy worms. Crocus metallorum, applied externally to cure a herpetic eruption, produced vomiting.‡

The experiments of Mr. Sherwen would lead us to conclude that tart. emet. externally applied, is taken up by the abſorbents and conveyed through the medium of the circulation to the ſtomach. Five grains of tart. emet. rubbed into the palms of the hands, in ſix hours produced a ſlight nauſea, burn-

† Edinburgh Medical Eſſays. Vol. II.

‡ Haller. Elements of Phyſiology. Vol. V.

ing of the ſkin and increaſed perſpiration. A larger quantity, rubbed into the hands and wriſts, produced, in a few hours after, a ſickneſs, briſk evacuation by ſtool, and an increaſed flow of urine for ſeveral days. In one caſe, the medicine, after producing ſlight nauſea and gentle catharſis, was ſucceeded in two or three days by a raſh with a conſiderable itching all over the ſkin, which continued ſome days. In a caſe, where diſagreeable ſymptoms had ſucceeded the drying up of an old ulcer in the leg, tart. emet. adminiſtered in this way produced nauſea, profuſe perſpiration, and a diſcharge from the ulcer, by which all the ſymptoms were relieved. Experiments with arſenic, made in the ſame manner as with tart. emet. prove, that it occaſions ſlight nauſea and increaſed flow of urine.* The dangerous properties of arſenic have hitherto intimidated practitioners from an extenſive uſe of it internally. If therefore experiments of this kind ſhould lead us to diſcover that arſenic, externally applied, is conveyed into the ſyſtem, and is a ſafe and efficacious diuretic, we ſhall add a new weapon to our ſtore for combating the dreadful diſeaſe of dropſy.

Certain Italian phyſicians have inſtituted experiments on this ſubject, the reſult of which would appear to favour our doctrine. A woman, having violent pains, and refuſing to take opium by the mouth, was a fit ſubject for experiment. Dr. Chiarenti diſſolved three grains of pure opium in two

* Medical memoirs. Vol. II.

ſcruples of the gaſtric juice of a crow; and after ſuffering it to remain at reſt ſome hours, he mixed it with ſimple ointment and rubbed it on the backs of her feet. In an hour the pains were wholly removed, and did not again return. Squills and foxglove were uſed in the ſame manner with equal ſucceſs. It appears, from experiment, that the application of theſe ſubſtances was moſt ſucceſsful, when they were diſſolved in gaſtric juice or ſaliva.

"Dr. Ballerini, of Mantua, cured one dropſy "with frictions of ſix grains of ſquills, diſſolved in "gaſtric juice, made every ſecond evening; and "another with one ſcruple of ſquills, diſſolved in "one dram of ſaliva, rubbed in at three times dur-"ing the courſe of the day. The aſſiſtants, who "made the frictions, had likewiſe an increaſed flow "of urine."

Profeſſor Brera uſed opium, in this manner, with ſucceſs in chloroſis; alſo ſquills, digitalis purpurea, corros. ſublim. aconite, and tart. emet. in other diſeaſes. From his obſervations he concludes, "That "every animaliſed fluid is fitted by nature to ren-"der remedies capable of being abſorbed."*

We have numerous inſtances of the unhappy conſequences attending the introduction of lead into the ſyſtem, which are perhaps more rationally explained on this principle than on any other.

Litharge carried under the arm-pits cauſed dyſpnæa, fainting, nauſea, vomiting, &c. Ceruſſe applied

* Annals of Medicine, Vol. III.

to a part that had been chafed produced ſimilar effects.* The immoderate uſe of the ſaturnine lotion for ſix days to a leg and foot, from which the cuticle had been ſtripped, produced colic, trembling of the limbs, continual nauſea and frequent vomitings.†

The application of Goulard's poultice to the knee, continued for ſome time, produced a violent pain in the bowels, which did not ceaſe until the removal of the poultice. Inſtances have occurred of convulſions being produced in children by ceruſſe ſprinkled on excoriated parts. It is not improbable that litharge, the common baſis of plaiſters, when employed in dreſſing iſſues, produces ſome of the common effects of the preparations of lead taken internally.‡

Dr. Baker obſerves "that he met with a moſt "violent and obſtinate colic, which ſeemed to have "been occaſioned by ſome litharge mixed in a "cataplaſm, and applied to the vagina with a view "to allay a troubleſome itching."

The vapour of lead, which exhales when it is melted, will excite colica pictonum, as in the caſe of plumbers and potters, and thoſe who make ſhot. This vapour, when the metal is heated by mere friction, will produce this colic, with all its terrible conſequences.§

"We want no authorities to teſtify, that the too "faſhionable application of ceruſſe to the ſkin,

* Haller. Elem. Phyſiolog. vol. V. † Percival's Eſſay on the poiſon of lead.
‡ Medical Tranſact. vol. I. § Med. Tranſact. Vol. I.

"has been followed by obſtinate colics, pains, "tremors and reſolution of the limbs, ſlow waſting "fevers and a pulmonary conſumption. For ſuch "frequently has been the fate of thoſe, who have "thus endeavoured to ſupply the defects of their "perſons, by a vain and temporary imitation of "beauty."*

"The vinegar of lead, diluted and rubbed upon "the ſkin, cures breakings out, redneſs, inflam- "mations, and the eryſipelas; it gives a whiteneſs "and beauty to the ſkin, but proves pernicious "to the body; at length occaſioning a conſump- "tion, as appears by many melancholy exam- "ples."†

The ung. ſaturnin. applied for ten days to parts, from which the cuticle had been removed, occaſioned a ſevere colic, reſembling in many of its ſymptoms, the colica pictonum. A gentleman, having ſtrained the tendo achillis of each leg, was adviſed to uſe a bath of vegeto-mineral water. The bath was ſo conſtructed, that he could immerſe his legs to the height of the calves. He uſed it for five or ſix minutes every morning and evening for a week, when he was obliged to deſiſt, from the violent ſpaſmodic and paralytic affections it occaſioned; nor did he recover from them for ſome time.‡

* Baker. † Boerhaave. Elem. Chem. Vol. II. proceſs 172.
‡ Med. Tranſact. Vol. III.

There is an inſtance upon record, of a palſy of both legs and arms, being induced by the application of facch. ſaturni. to venereal warts, for the purpoſe of deſtroying them.*

"A gentleman, who had for many years had a "fontinel, finding that the pea was not ſufficiently "depreſſed for two or three years paſt, applied oc-"caſionally, a piece of the thinneſt lead over the "oil-ſkin which covered the pea. This apparently "anſwering the purpoſe, the oil-ſkin was by de-"grees omitted; ſo that the lead was generally in "immediate contact with the pea and the orifice "of the fontinel.

"This was the caſe about the end of June, "1771; when an uneaſineſs and oppreſſion, were "felt at the præcordia and diaphragm, with anxie-"ty and difficulty on making a deep inſpiration. "The diſorder, daily increaſing, became, towards "the end of July, ſo grievous as to require the "ſerious attention of the perſon afflicted. On re-"collection, he began to ſuſpect, that his complaints "might be owing to the noxious quality of the "lead, which covered the fontinel. He therefore "immediately threw it off; and from that time, "without the uſe of any medicines, the diſorder "very ſoon abated, and in about one month was "entirely removed; nor has it in any degree re-"turned."§

* Med. Tranſact. Vol. II. § Baker on the poiſon of lead.

The inferences to be drawn from the abovementioned facts, muſt be ſufficiently obvious to the candid obſerver. If we take into conſideration the various circumſtances attending the external application of lead in theſe caſes, ſome light may be thrown upon the ſubject. It was neceſſary for a certain portion of time to elapſe before the poiſon manifeſted its effects. If it operated by ſympathy, the effect ſhould be inſtantaneous, as we know to be in other caſes where the phenomena are referred to an unknown ſympathy. But as we find that a ſpace of time, ſufficient for the introduction and diffuſion of the poiſon in the circulation, muſt intervene before its effects are perceived, we have a right to ſuppoſe that it does enter the circulation, and thus produces its miſchievous conſequences. The ſymptoms attending, coincide ſo exactly with thoſe which ſucceed the internal uſe of lead, that they afford ſtrong reaſon to believe the poiſon acts immediately upon the parts affected. This can only be effected by its entering into the circulation in its active ſtate.

The dangerous conſequences, which ſometimes reſult from the external uſe of the preparations of lead, under certain circumſtances, ſhould teach us caution in the management of this metal. This appears to be more eſpecially neceſſary in caſes where the parts have been excoriated, as in thoſe ſituations the abſorbents ſeem to be peculiarly active. The pernicious practice of applying to the ſkin pigments,

of which lead is a conſtituent part, cannot be too ſtrongly reprobated. By diminiſhing the ſenſe of the danger, we encourage the growth of the evil. It is only by inculcating the opinion, that the poiſon of lead may be abſorbed into the circulation, and thus be productive of the moſt dreadful conſequences, that we can hope to arreſt this deſtructive faſhion. Mercury is often adulterated with lead, and its uſe is ſometimes attended with the peculiar effects, which ſucceed the uſe of the preparations of lead. It is therefore of ſome conſequence to keep this circumſtance in our remembrance, when we are exhibiting mercury.†

Obſervation would lead us to ſuppoſe, that lead internally uſed, paſſes into the circulation in its active ſtate. Is not this ſuppoſition rendered probable from the palſies of the limbs, which ſucceed colica pictonum? Here is an affection of parts diſtant from thoſe to which the poiſon is directly applied. Colics, which ariſe from other cauſes, are not attended with ſimilar conſequences. Is not the ſuppoſition further ſtrengthened by the fact, aſcertained from Mr. Hunter's experiments, that the application of ſacch. ſaturni. to the muſcles of dogs, produced in them the ſame appearance which is exhibited by the muſcles of painters labouring under paralyſis? Sour wines ſweetened with lead have produced many unhappy conſequences of this kind. It is known that

† Baker on the poiſon of lead.

ſacch. ſaturni. will render gin, which has a yellow tinge of a beautiful tranſparent whiteneſs. This iniquitous proceſs has been too frequently the unſuſpected cauſe of many diſtreſſing ſymptoms. The honey extracted by bees from the kalmia latifolia, (baſtard laurel) and ſome other poiſonous plants, has the remarkable property of proving errhine, after it has been taken into the ſtomach ſome time. It produces ſneezing occaſionally for two or three days afterwards.* The powder of the different parts of the kalmia latifolia is conſiderably errhine.† How can we account for this ſtrange effect, but by ſuppoſing that the honey is taken into the maſs of blood and that it continues to circulate in its active ſtate for ſome days?

From what has been ſaid concerning the proofs of the opinion, which is maintained in this eſſay, as they appear in the blood, we learn in the firſt place, that active ſubſtances, directly mixed with the blood, are not neceſſarily fatal, but ſometimes ſalutary. Secondly, knowing this fact, we can more eaſily explain on this principle than on any other, certain phenomena reſulting from the external application of medicines. Thirdly, circumſtances, attending the internal exhibition of ſome medicines, are moſt eaſily accounted for by this opinion.

* Barton's lectures on materia medica.

† Eſſay towards a materia medica of the United States.

III. Milk. Certain ſubſtances manifeſt their preſence in the milk by their colour, taſte, ſmell or peculiar effects.

Milk is faintly tinged of a red colour from eating the Indian fig, and alſo from madder: it aſſumes a blue colour from the uſe of indigo.†

Saffron imparts its colour to the milk of women uſing it.‡

The ſugar of milk depends upon the quantity of ſugar contained in the aliment which is uſed. Its acéſcency is ſuppoſed to proceed from the uſe of vegetable aliment. Cows, fed upon certain vegetables, give milk of a colour and taſte ſimilar to thoſe vegetables, as the horſe-cheſnut, madder, &c. All the ſiliquoſa communicate a peculiar taſte and odour to the milk of animals feeding on them.§

It is a fact very generally known, that where animals feed upon garlic, pepper-graſs, ſalt-marſh, &c. their milk, and the butter obtained from it, partake of the taſte and ſmell of the ſubſtance uſed.

Animals, feeding on a certain ſpecies of gentian, have their milk, and the cheeſe made from it, of a bitter taſte. We may diſcover in milk both the ſmell and taſte of the ſtrong treacle-muſtard, and alſo of ſaffron. The bitterneſs of wormwood and the ſmell of thyme are often perceptible in milk.‖

† Haller. Elem. Phyſiolog. Vol. VII. de lacte.

‡ Ferris on milk.

§ Barton's Lectures on Materia Medica.

‖ Haller. Elemen. Phyſiolog. Vol. VII.

The peculiar effects produced by the milk of animals, which have fed upon particular plants, evince that the active matter is carried into the circulation, and retains its properties even in the secreted fluids.

A case is related by Dr. Cooper, of a woman who was salivated, producing the same affection in a child sucking her. Gmelin asserts that the milk of salivated animals will salivate a child. Dr. Hamilton detected globules of mercury in the milk of a salivated woman, by slow evaporation.†

The properties of spurge have manifested themselves even in cheese; the eating of such cheese having occasioned dangerous vomiting and purging. The milk of cows, which feed on the hedge hyssop, is purgative. A nurse having taken a purgative medicine and afterwards suckling a child, a hypercatharsis was induced on the child; but the nurse felt no ill effects from the medicine. A boy, who was sucking a nurse that had drunk spirituous liquor, was thrown into violent convulsions.‡ Infants, from being suckled by drunken nurses, have contracted a propensity for strong drink.§ A child was intoxicated by the milk of a nurse, who had taken a considerable quantity of opium.‖

The ancients were so strongly persuaded that substances were taken into the circulation in their

† Barton's Lectures on Materia Medica.

‡ Haller. Elem. Physiol. Vol. VII.

§ Ferris on milk.

‖ Barton's Lectures on Materia Medica.

active ſtate, that in certain diſeaſes they preſcribed the milk of animals which had fed on vegetables proper for the cure of thoſe diſeaſes.*

The milk of goats, which have fed on aſtringent and balſamic herbs, is recommended as an excellent remedy in certain ſpecies of diarrhæa. Thus alſo the properties of pellitory, madder, the leſſer nettle, lettuce, purſlain, on which cows have fed, are carried into the milk ſo unchanged, that they produce their uſual effect in the ſick who uſe this milk.†

Some modern writers alſo entertain the opinion, that the active properties of ſubſtances are found in the milk. The celebrity of theſe writers cannot fail to give additional ſupport to the opinion. A nurſe, by eating of cabbage, or of other flatulent vegetables, always gave her ſucking child the windy gripes.‡ To prevent the belly-ach, which is ſo frequent among ſucking children, their nurſes ſhould be careful to avoid eating vegetable food.§ In cholera infantum, when the child is reduced ſo low in the latter ſtage of the diſeaſe that it cannot ſwallow cordial medicines; if it be ſucking, the medicines are to be adminiſtered to the nurſe, and they will in this way enter the ſyſtem of the child.‖ Theſe obſervations teach us a new mode of exhibiting medicines, from the proper management of which much advantage may be derived. In conſti-

* Ferris on milk. † Haller. Elem. Phiſiol. Vol. VII.
‡ Percival's Eſſays. Vol. I. p. 168. § Ruſh's Lectures.
‖ Ruſh's Lectures.

tutions, where peculiar circumſtances render the direct application of remedies improper, we may perhaps adminiſter medicated milk with eſſential benefit. In caſes where it is neceſſary that medicines ſhould be exhibited for a long time, gradually, and in ſmall quantity, no more agreeable mode could be diſcovered. The facts that have been related clearly prove, that the active properties of ſome ſubſtances are found in milk; and it is at leaſt worth the trial, to endeavour to apply this principle to ſome uſeful purpoſe.

IV. Saliva. Some proofs may be adduced, which appear in the ſaliva. The property of exciting an increaſed flow from the ſalivary glands, which is manifeſted by certain ſubſtances, ſome time after they have been taken internally or applied to the external ſurface, is only to be explained by ſuppoſing that theſe ſubſtances are conveyed in their active ſtate, through the medium of the circulation to the parts affected.

A partial and temporary ſalivation may be produced by topical ſtimulants applied to the glands. This ceaſes ſhortly after the irritant, which excited it, is removed from the mouth, and may be referred wholly to the direct external application of ſtimulus. But the ſalivation, occaſioned by mercury, and ſome other articles, remains long after their uſe has been relinquiſhed, and can only be accounted for on the principle we have adopted.

Mercury is taken into the circulation in many caſes, eſpecially where it excites ſalivation. It reaches and acts upon the organs of perſpiration. The long continued uſe of it, produces an inflammatory cruſt upon the blood. Certain preparations of antimony, alſo ſalivate; and the ſame effect is produced by oxygen gas, nitric acid, citric acid and polygala Seneka, &c.*

Lead, uſed internally, has been known to ſalivate. In the caſe of Profeſſor Thunberg, related by himſelf, it is obſerved, that in eight days after the ſalivation commenced, lead was perceived in the ſaliva.† The oil of the melaleuca leucadendron, rubbed upon the ſoles of the feet, manifeſted its taſte in the mouth. Petroleum, dropped upon the head, diſcovered its taſte in the mouth.‡

V. Urine. The facts, which are related reſpecting the preſence of ſubſtances in their original ſtate, in the urine, are ſo numerous and well authenticated, that none will heſitate in giving his aſſent to them. Certain articles impart to the urine, their colour, taſte, ſmell, or imbue it with their peculiar properties.

"Extract of logwood, taken internally, ſome-"times gives a bloody hue to the urine." Its aſtringent property, often accompanies its colouring matter.§ Perſons eating the Indian fig, have

* Barton's lectures on materia medica.

† Voyage to the Cape of Good-Hope, Vol. I.

‡ Haller. Elem. Phyſiolog. Vol V.

§ Percival's Eſſays.

their urine of a blood colour; the ſame takes place from eating red beets, or madder. It becomes blue from indigo. Aſparagus and olives, communicate a ſtrong ſmell to it. Turpentine gives it a violet ſmell. It is alſo ſcented by nutmegs, mace, cloves, juniper, parſley-roots, fennel, carrot, parſneps. It is made bitter by balſam copaibæ. Vinous ſpirits are ſometimes found in the urine; alſo oil ſhortly after it has been taken in. A certain ſpecies of muſhroom, poſſeſſing an intoxicating property, is found to retain this property, after paſſing into the urine.*

Rhubarb, taken into the ſtomach, colours the urine for many hours after. It is ſaid to poſſeſs a diuretic property. The oil of ſavin ſometimes exerts diuretic effects upon the kidneys, and in theſe caſes the urine is impregnated with its ſmell.† Nitre, taken internally, is found in the urine in its native ſtate. When applied to the external ſurface of the body, it is taken up by the abſorbents and conveyed through the medium of the circulation into the bladder, unchanged. A ſolution of nitre, applied in a pediluvium, is ſaid to have been abſorbed into the circulation; for a piece of paper, dipped in the urine and dried, burnt in the ſame manner as touch-paper.§

* Haller. Elem. Phyſiolog. Vol. VII. de Urinæ.

† Barton's lectures on materia medica.

§ Zoonomia. Vol. III. p. 361.

Turpentine acts as a diuretic; when taken in large doſes it produces ſtranguary, diabetes, &c. and hence we infer that it has a peculiar action on the kidneys. Whether applied externally or internally it diſcovers its ſmell in the urine. We have a proof that it is taken into the circulation and carried to the bladder, from its correcting the peculiar ſmell which is obſerved in the urine of perſons who have eaten of aſparagus.*

Kaauw Boerhaave relates, that a man, holding turpentine in his hands for ſome time, perceived in his urine the ſame violet ſmell, which is obſerved when turpentine has been taken into the ſtomach.†

This fact is familiar to anatomiſts, who are in the habit of injecting dead bodies and waſhing their hands with ſpirits of turpentine.

The different ſpecies of garlic appear to paſs into the circulation, particularly affecting the urinary ſyſtem, and ſometimes diſcovering their ſmell in the urine and perſpiration. From their ſuppoſed property of paſſing into the urine unchanged, they have been recommended as lithontriptics. Some of the ſiliquoſa are uſed in dropſies, with advantage. Their active matter is probably carried into the circulation and thus to the kidneys, occaſioning heat of urine, &c.‡

* Barton's lectures on materia medica.

† De Perſpiratione. No. 430.

‡ Barton's lectures on materia medica.

It is ſuppoſed that the ſtrangury, which ſometimes ſucceeds the external application of cantharides, is occaſioned by the abſorption and internal ſtimulus of them. This opinion is ſupported by the following obſervations:

1. "Neither muſtard, the actual or potential "cautery, nor any other veſicating ſtimulus, but "cantharides, excite this complaint."

2. "Drinking plentifully prevents the ſtrangury, "by diluting in the kidneys and bladder the acri- "monious particles of the cantharides."

3. "A bliſter, laid upon the head immediately "after ſhaving, is almoſt always ſucceeded by the "ſtrangury; whereas no ſuch effect takes place, if "the application be delayed twenty-four hours."†

The effects produced by certain medicines, which have been uſed as lithontriptics, render it probable that they are conveyed into the urine, unchanged. From the remarkable effects produced by uva urſi in nephritis, have we not a right to ſuppoſe that it is conveyed into the circulation unchanged? The acid liquor, which is obtained from uva urſi, attacks human calculi, diminiſhes them and ſoftens the parts which it cannot diſſolve. Nor was there one, among one hundred and fifty calculi, which it could not diſſolve. It is not probable that its powers are loſt, when it is given internally; for when mixed with blood and bile it ſtill retained its ſolvent

† Percival's Eſſay on bliſters.

property. It appears to abſtract the mucus from the calculus, to looſen the connecting medium of the earth which compoſes it, and to diminiſh the whole ſtone by diſſolving a part and ſoftening the remainder which was inſoluble.*

The carbonate of ſoda is equally efficacious in alleviating the diſtreſſing ſymptoms of nephritis, and in cauſing large quantities of gravel to paſs off by urine. "The ſtones voided appeared half diſſolved, "which before had been hard and rough, and when "dry ſeemed to be covered with a fine ſoft pow-"der. The uſe of this medicine produced "a "large mucous and very ropy ſediment in the urine "and a great abatement of pain." This medicine has alſo given great relief in biliary calculi of long ſtanding.† Fixed air is aſſerted to be lithontriptic. Doctor Percival informs us, that an eminent phyſician in London has been ſucceſsful in the uſe of it, "having brought away in ſmall fragments, "and in a whitiſh chalk-like ſubſtance, a ſtone "from the urinary bladder, by adminiſtering fixed "air to his patient during the ſpace of a few "weeks."‡ Several reſpectable authorities have adopted the opinion, that fixed air may be conveyed unchanged into the bladder. Although it may be doubted whether fixed air can be conveyed through the circulation into the bladder; yet it appears from experiment that from a certain quantity of freſh made urine, one fifth of its bulk of pure

* Haller. Hiſtor. Stirp. Indigen. Helvet. Vol. I.

† Beddoes. ‡ Percival.

fixed air was obtained. Drinking water containing this air may impregnate the urine with it, and make it more efficacious in diſſolving calcareous matters than it would otherwiſe be.*

The drinking of waters impregnated with fixed air is recommended and extolled by Hoffman and others, as very efficacious in preventing and diſſolving calculi. Human calculi, by being macerated in theſe waters, were conſiderably diminiſhed. They are alſo diminiſhed by immerſion in the urine of thoſe perſons, who had drunk water impregnated with fixed air; while the urine of a perſon in health, not uſing ſuch water, had no effect in leſſening their bulk.†

From this fact the inference muſt certainly be drawn, that fixed air is conveyed unchanged into the urine.

Doctor Sydenham entertained the idea that malt liquors alleviated the pain and irritation ariſing from gravel. In his own caſe, he obſerves, that whenever he was obliged to ride over ſtones, it was his cuſtom to take one or two large draughts of ſmall beer, which prevented bloody urine.

Doctor Dobſon obſerves, "that upon the whole "the ſedative and ſolvent powers of fixed air, in "caſes of the ſtone, are ſo far aſcertained, as to "give it a claim to the particular attention of the "faculty. Further experience can alone determine

* Prieſtly on air Vol. II. page 216-17. † Dobſon on fixed air.

" whether, by the ſteady and long continued uſe of " this medicine, a cure may not in ſome inſtances " be happily effected."

It appears that the urine of perſons, uſing alkaline remedies becomes alkaline, and that it exerts ſome degree of a ſolvent power upon urinary calculi immerſed in it.*

Doctor Falconer ſpeaks very highly of the uſe of the aqua mephitica alkalina, or ſolution of fixed alkaline ſalt, ſaturated with fixible air in calculous complaints. In the caſe of Mr. Colbourne, who had occaſionally paſſed ſmall ſtones and was much troubled with nephritic ſymptoms, he obſerves " that, " during the uſe of the mephitic alkaline ſolution, " he parted with no gravel, his urine depoſited no " ſediment, whatever, or diſcoloured the veſſel; " though, if it was omitted even for a few days, " theſe appearances took place and ſmall bits of " gravel were perceivable in his water." The uſe of this ſolution is obſerved to correct the fœtor and diſpoſiton in the urine to putrify, which manifeſted themſelves previouſly to its uſe.† It is well known that fixed air will retard the putrefactive fermentation out of the body, and hence the foregoing fact furniſhes us with an analogical argument that this air is conveyed into the bladder.

Human calculi, immerſed in this ſolution, were found to loſe a conſiderable part of their weight.

* Home's Clinical Experiments and Hiſtories.

† Falconer on aqua mephit. alkal.

A daily portion of the urine of a perſon, who uſed the ſolution, was poured upon a fragment of a calculus for ſix months, at the end of which time it had loſt two-thirds of its original weight. Upon another fragment of the ſame calculus, a daily portion of the urine of a perſon in health, not uſing the ſolution, was poured for two months, but did not exert any ſolvent effect.* Does not this prove that the ſolution is conveyed unchanged into the bladder? The preparations of ſome of the metals are found in the urine in their original ſtate, as is diſcovered by the uſual teſts. "Iron appears to poſ-"ſeſs the property of paſſing into the circulation "under the form of æthiops. The valuable expe-"riments of Menghini, publiſhed in the memoirs "of the inſtitutes of Bologna, have proved that "the blood of perſons, who take martial remedies, "is thicker and contains more iron. Mr. Lorry "obſerved that the urine of a ſick perſon, to "whom he adminiſtered iron in a ſtate of extreme "diviſion, was manifeſtly coloured with the nut-"gall."†

From what has been related, reſpecting the preſence of ſubſtances in the urine, it muſt be granted by all, that certain matters are found in this fluid in their original ſtate.

It is, however, denied, by a celebrated and ingenious writer,‡ that active ſubſtances are conveyed

* Falconer. † Chaptal's Elements of Chemiſtry, part iii. chap. x.
‡ Darwin.

through the courſe of the circulation into the bladder. He aſſerts that the lymphatic veſſels of the bladder, communicating with the abſorbents of the inteſtines, take on a retrograde action, and thus an eaſy and direct paſſage is made into the bladder. One of the principal arguments for this opinion reſts upon the phenomena obſerved in diabetes. It is ſuppoſed that the immenſe quantity of urine, which is ſometimes diſcharged in this diſeaſe, cannot be ſecreted by the kidneys, but muſt paſs by ſome direct communication between the alimentary canal and the bladder. This opinion is ſaid to be ſupported by the circumſtances attending the drinking of mineral waters. It has been ſuppoſed that the ſhort time, in which the flow of urine takes place after receiving theſe waters into the ſtomach, demonſtrates the exiſtence of ſome more direct route than through the ureters. "But in this caſe "the ſtimulus of cold water received into the ſto-"mach, like external cold applied to the ſkin, "cauſes a concuſſion of the bladder and urinary "parts, by which they are ſolicited to repeated diſ-"charges of the old urine which was before in the "body, and not immediately of that which was "laſt drunk. Again, one thouſand ounces of "blood are conveyed through the kidneys in an "hour, and this is ſurely ſufficient to furniſh twenty "or even fifty ounces of urine. Finally, it is cer-"tain that both men and brute animals periſh, if

" the ureters are obſtructed by a ligature or other-
" therwiſe. We then obſerve alſo that no urine
" can be found in the bladder."*

The limits of this eſſay will not allow a fuller inveſtigation of the doctrine of the retrograde motion of the abſorbent veſſels; and the more eſpecially as it is not ſtrictly connected with the preſent ſubject of inquiry.

VI. Perſpiration. Marks, that ſubſtances have entered the circulation in their active ſtate, are ſometimes found in the fluid excreted from the ſurface of the body.

Opium is abſorbed into the blood-veſſels. Haller aſſerts that the ſmell of opium is ſometimes obſerved in the perſpiration, particularly in his own caſe.†

The active property of camphor appears to reſide in a volatile vapour; it is ſometimes abſorbed into the maſs of blood, is known to ſalivate, and diſcovers its ſmell in the perſpiration and ſweat.‡

The common garlic and the red onion, when taken into the ſtomach paſs off by perſpiration, occaſioning coſiderable thirſt, &c. The ſmell of garlic is ſaid to be perceived in iſſues, fiſtulæ, &c.§

It is probable that elixir vitriol is conveyed into the vaſcular ſyſtem and excreted by the pores of the ſkin. It is ſaid to perform a cure in nurſes, who

* Syſtem of Anatomy, Vol. II. p 411.

† Barton's lectures on materia medica.

‡ Barton's Lectures on Materia Medica. § Ibidem.

are affected with the itch, and alſo in children ſucking them.*

Dr. Ruſſell remarks that the people of Aleppo, who take large quantities of oil internally, are found to have oil tranſuding through the pores of their ſkin. Oil obtained from the livers of cod-fiſh, adminiſtered internally in the Mancheſter hoſpital, manifeſted its nauſeous taſte and ſmell in the perſpiration of thoſe who uſed it. "An oil of the ſame kind "forms no inconſiderable part of the food of many "northern nations; and it is ſaid to penetrate and "imbue the deepeſt receſſes of the body." †

We have thus endeavoured to exhibit a comprehenſive view of the proofs of the opinion, maintained in this eſſay, as they appear in the fluids. Conſidered individually they may not perhaps amount to demonſtration, but taken collectively, it is preſumed, they will make ſome impreſſion upon the mind of the cadid inquirer.

That medicines ſhould be conveyed into the circirculation unchanged, or, if decompoſed, that they ſhould be recompoſed, is not more ſtrange or unaccountable than that urine, ſemen, &c. ſhould be ſecreted from the blood. Chemiſtry preſents us with an analogy. We ſee, that by the union of two different ſubſtances, a third is produced differing in quality from either. By the addition of another ſubſtance we procure one of the firſt conſtituents in

* Percival's Eſſays. † Ibidem.

its original form and properties; May not a proceſs ſimilar to this be carried on in the circulation? Much yet remains to be explored.

SECTION III.

Of the Proofs, as they appear in the Solids.

THE proofs that have been already adduced in ſupport of the opinion, that certain ſubſtances enter the circulation in their active ſtate, afford at leaſt a high degree of probable evidence. We now come to conſider the proofs, with which we meet in the ſolids. Theſe, although few in number, are deciſive, and muſt carry conviction to the lover of truth. They are arranged as they appear in the ſkin, fleſh and bones.

I. Skin. Sulphur, after paſſing through the circulation and being conveyed to the ſkin, evidently recovers its original properties. It communicates its particular odour to the perſpiration, and blackens ſilver, &c. A gentleman, who was in the habit of taking ſulphur daily, perceived, after ſome time, that his ſilver knee-buckles were made black and alſo his watch.

It is obſerved, by Biſhop Watſon, that perſons, uſing coſmetic lotions containing lead, and at the ſame time drinking ſulphurated waters, will have

the parts, to which the lotions are applied, changed black.

" Dr. Swediaur relates the caſe of a Proteſtant " miniſter, near Hamburgh, who took, by the di- " rection of an empiric, ſome nitrate of ſilver for " an obſtruction of the liver. After continuing " this medicine for ſeveral months, his ſkin began " to change gradually, till at laſt it became almoſt " perfectly black. This colour laſted during ſeve- " ral years, but is now wearing off."*

The active part of the diet of ſome animals, ſeems to enter into the courſe of the circulation, and to manifeſt itſelf perceptibly in their integuments. The Turkey-buzzard (Vultur Aura of Linnæus) is a carnivorous bird, and feeds upon the putrid carcaſes of animals. The quills of theſe birds have generally ſuch a ſtinking odour, that we are obliged to keep them a long time, before they become fit for uſe.†

II. Fleſh. The active properties of certain ſubſtances, which are eaten by animals, are conveyed into the circulation in ſuch an unchanged ſtate, that the fleſh of theſe animals will produce the ſame effect, as is produced by thoſe ſubſtances. It is a fact, well known, that the fleſh of wild pigeons, which have eaten the berries of the phytolacca or poke root, will purge, if a conſiderable quantity of it is taken into the ſtomach. The fleſh

* La medicine éclairée par les ſciences phyſiques, &c. Fourcroy.

† Barton's lectures on Natural Hiſtory.

of pheaſants, which have fed upon the kalmia latifolia or wild laurel, one of the moſt fatal poiſons, has been known in ſeveral well authenticated inſtances, to exert deleterious effects, in a few hours after it has been taken into the ſtomach.*

Dr. Barton informs me, that he has been conſiderably purged by eating the fleſh of deer, which had fed upon the leaves of the kalmia latifolia. Dogs, who had eaten the fleſh, were affected with convulſions and paralyſis of the hinder legs.

Kempfer (in his Hiſtory of Japan) mentions a fiſh,† which being fed with a certain poiſonous plant, is infected with its peculiar deleterious properties, and deſtroys the perſons who eat of it.

The red ſea-bream when found in the South Sea, ſalivates. This fiſh, taken in the Pacific and Atlantic Oceans, does not produce this effect. The peculiar property of ſalivating, is occaſioned by its eating the meduſa or ſea-blubber, which is known to poſſeſs this property.‡

The balſam of the populus balſamifera (called balſam or tacamahaca tree) is ſo very penetrating, that it communicates its peculiar ſmell and taſte, to the fleſh of certain birds, which feed upon the buds.§ The onion has ſuch a durable ſtrong taſte and ſmell, that it is perceived in the fleſh of peacocks, who are fond of eating it.‖

* Medical Repoſitory. Vol. I. p. 161. † Tetraodon ocellatus.

‡ Cook's voyages.

§ Barton's Eſſay towards a Materia Medica of the United States

‖ Haller. Hiſtor. Stirp. indigen. Helvet. Vol. II.

It is generally known, that the fleſh of ſome animals, killed at a particular ſeaſon of the year, is ſtrongly tainted with garlic. This is particularly the caſe with ſucking calves, who receive it through the medium of the milk. "The London "mutton is known to taſte ſtrong of turnips, with "which the ſheep prepared for market are chiefly "fed."

The following fact is tranſcribed from an ancient book, in its original ſtyle and language.

"Here a multitude of the inhabitantes, as well "women as men, reſorted to hym (Columbus) "with cheerefull countenaunce and without feare: "bringynge with them popinjayes, breade, water "and cunnyes. But eſpecially ſtocke-doves muche "bygger then owres: which, he affirmeth, in ſa-"voure and taſte to be muche more pleaſaunt then "oure partryches. Wherefore, as in eatinge of "them he perceaved a certyne ſavoure of ſpyce "to proceade from them, he commaunded the "Croppe to bee opened of ſuch as were newely "kylled, and fownde the ſame full of ſweete "ſpyces, whiche he argued to bee the cauſe of "theyr ſtrange taſte. For it ſtandeth with good "reaſon, that the fleſhe of Beaſtes ſhulde drawe "the nature and qualitie of theyr accuſtomed "nuryſhemente."*

Wormwood affects not only the milk, but alſo the fleſh of animals, with its intenſe bitterneſs.†

* Tranſlation of the Decades of Peter Martyr. Decad. I. p. 16-17. London Edition, 1555.

† Barton's Lectures on Materia Medica.

"Our table was always plentifully and even "luxuriouſly, furniſhed with truffles, red-legged "partridges, and a great variety of ſmall birds; "the latter were not indeed very palatable to us at "firſt, on account of the high flavour of the juni-"per berries on which they fed."*

Birds, which live wholly on fiſh, have their fleſh to taſte of fiſh. Mr. Hunter obſerves, "this fact "was ſo well known, that it was hardly neceſſary "to put it to the teſt of an experiment. Yet he "took two ducks, and fed one with barley, the "other with ſprats for about a month, and killed "both at the ſame time; when they were dreſſed, "the one fed wholly with ſprats was hardly eata-"ble, it taſted ſo ſtrongly of fiſh."†

Let the candid reader weigh, with mature conſi-deration, what has been ſaid under this head, and then decide whether any doubt remains with him on this ſubject.

III. Bones. We meet with but few proofs, in the bones, of ſubſtances being conveyed into the circulation in their active ſtate. Perhaps this is owing to want of attention. One ſolitary fact, however, would be more in point, than a thou-ſand which are negative.

Mercury is received into the blood unchanged; for it has been found fluid and in its native ſtate, in the cells of the bones.‡

* Smith's Tour. Vol. I. p. 146. † Animal Œconomy. p. 177.
‡ Haller. Elemen. Phyſiolog. Vol. VI.

It would appear that ſome ſubſtances, which loſe their properties on entering the circulation, again acquire them after having paſſed through it. Thus madder does not tinge the ſkin, muſcles, ligaments or fat, but when carried to the bones, it colours them.*

"The bones of the Canada porcupine, during "winter, are of a greeniſh yellow, owing, as is "ſuppoſed, to the bark of the pine on which the "animal feeds in that ſeaſon of the year."†

In the diſeaſe of rickets, which is ſuppoſed to be occaſioned by a deficiency of bony matter, the exhibition of lime-water, both internally and in the form of bath, has been found exceedingly advantageous. May we not reaſonably ſuppoſe that the lime is carried into the circulation and there, meeting with the phoſphoric acid, ſupplies the bony matter where it is wanting?‡

Circumſtances, unavoidable, do not permit the further inveſtigation of the preſent intereſting inquiry. I regret that the ſame circumſtances prevented me from beſtowing a longer and more minute attention upon this ſubject than I have done. The field is truly extenſive, and patient, perſevering labour may glean much valuable fruit from it. No other merit is claimed in this diſſertation, than the having collected together into one body the ſcattered

* Percival's Eſſays.

† Pennant's Arctic Zoology. Vol. I p. 126.

‡ Medical Repoſitory. Vol. I. p. 427.

remarks and opinions of various writers. If this eſſay ſhould direct the attention of ſome future enterprizing genius to this too much neglected ſubject, and if it ſhould meet with the approbation of thoſe, whoſe eſteem the writer is moſt anxious to deſerve, he will be amply repaid for his exertions in the field of ſcience.

To depart from this univerſity, without expreſſing a ſtrong ſenſe of the advantages it offers, in the proſecution of the ſtudy of medicine, would be highly unjuſt and ungrateful. To the numerous teſtimonies of the zeal, diligence, and abilities of the different medical profeſſors, mine is now cheerfully added. To ſome of them I am indebted, not only for public inſtruction, but for numerous private acts of friendſhip and politeneſs. To theſe I now offer publicly my ſincere thanks.

FINIS.

remarks and opinions of various writers. If this essay should direct the attention of some future enterprizing genius to this too much neglected subject, and if it should meet with the approbation of the whole, whose esteem the writer is most anxious to deserve, he will be amply repaid for his exertions in the field of science.

To depart from this university, without expressing a strong sense of the advantages it offers, in the prosecution of the study of medicine, would be highly unjust and ungrateful. To the numerous testimonies of the zeal, diligence, and abilities of the different medical professors, mine is now cheerfully added. To some of them I am indebted, not only for public instruction, but for numerous private acts of friendship and politeness. To these I now offer publicly my sincere thanks.